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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample and a personnel evaluation form are also included. (AG)

August 1969 United States Training and Employment Service Technical Report S-441

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ED 069628

TI 002 053

Development of USTES Aptitude Test Battery

for

Body Maker Feeder ~~And Side Seam Tender~~

(tinware) 616.885

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U.S. DEPARTMENT OF LABOR
MANPOWER ADMINISTRATION

ED 069628

Technical Report on Development of USTES Aptitude Test Battery

For . . . . . .

Body Maker Feeder ~~and Side Seam Tender~~ (tinware) 616.885

S - 441

(Developed in Cooperation with the California, Illinois, Maryland, Missouri and Texas State Employment Services)

U. S. Department of Labor
Manpower Administration

August 1969

FOREWORD

The United States Training and Employment Service General Aptitude Test Battery (GATB) was first published in 1947. Since that time the GATB has been included in a continuing program of research to validate the tests against success in many different occupations. Because of its extensive research base the GATB has come to be recognized as the best validated multiple aptitude test battery in existence for use in vocational guidance.

The GATB consists of 12 tests which measure 9 aptitudes: General Learning Ability, Verbal Aptitude, Numerical Aptitude, Spatial Aptitude, Form Perception, Clerical Perception, Motor Coordination, Finger Dexterity and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, with a standard deviation of 20.

Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, in combination, predict job performance. For any given occupation, cutting scores are set only for those aptitudes which contribute to the prediction of performance of the job duties of the experimental sample. It is important to recognize that another job might have the same job title but the job content might not be similar. The GATB norms described in this report are appropriate for use only for jobs with content similar to that shown in the job description included in this report.

GATB Study #2676

DEVELOPMENT OF USTES APTITUDE TEST BATTERY

FOR

Body Maker Feeder [redacted] (tinware) 616.885-046

S-441

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Body Maker Feeder [redacted] (tinware) 616.885-046. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
N - Numerical Aptitude	75
F - Finger Dexterity	75
M - Manual Dexterity	80

RESEARCH SUMMARY

Sample:

49 male Body Maker Feeder [redacted] in California, Illinois, Maryland, Missouri and Texas. Twelve of these were identified as Negroes and eight were identified as Spanish Americans. The remainder were non-minority group members.

Criterion:

Supervisory ratings.

Design:

Concurrent (test and criterion data were collected at approximately the same time.)

Minimum aptitude requirements were determined on the basis of a job analysis and statistical analyses of aptitude mean scores, standard deviations, aptitude-criterion correlations and selective efficiencies.

Concurrent Validity:

Phi Coefficient = .24 ($P/2 < .05$)

Effectiveness of Norms:

Only 69% of the nontest-selected workers used for the study were good workers: If the workers had been test-selected with the above norms, 82% would have been good workers. 31% of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 18% would have been poor workers. The effectiveness of the norms is shown graphically in Table 1:

TABLE 1

Effectiveness of Norms

	Without Tests	With Tests
Good Workers	69%	82%
Poor Workers	31%	18%

SAMPLE DESCRIPTION

Size:

N = 49

Occupational Status:

Employed workers

Work Setting:

Workers were employed at Continental Can Company plants in Baltimore, Maryland; Houston, Texas; Los Angeles, California; Chicago, Illinois and St. Louis, Missouri.

Employer Selection Requirements:

Education: High school graduates preferred by most plants and required in St. Louis.

Previous Experience: None. Workers in some of the plants in other job classifications may bid on the Body Maker Feeder ~~And Side Seam Tender~~ job.

Tests: Test requirements have varied between plants and from one year to the next. At time of testing, plant requirements were as follows:

Baltimore - Wonderlic Personnel Test
Houston - Purdue Mechanical and Wonderlic Personnel tests. (Workers may have taken S-98 or S-192 and Pseudoisochromatic plates if they entered plant through other jobs.)
Los Angeles - Wonderlic Personnel Test with cut off of 18.
Chicago - None.
St. Louis - None.

Other: Eighteen years of age. General screening interview held.

Principal Activities:

The job duties for each worker are comparable to those shown in the job description in the Appendix.

Minimum Experience:

All workers in the sample had at least two months total job experience.

TABLE 2

Means, Standard Deviations (SD), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, and Experience

	Mean	SD	Range	r
Age (years)	34.1	8.4	21-58	.120
Education (years)	11.3	1.8	4-14	-.013
Experience (months)	67.4	69.9	2-270	.226

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002B were administered between January 1968 and December 1968. The Research Questionnaire-Background was also administered.

CRITERION

The criterion consisted of supervisory ratings of job proficiency made at approximately the same time as the test data was collected. Ratings and re-ratings were made by the immediate supervisor of each worker in the Baltimore and Los Angeles samples with a two-week interval between ratings. Ratings from two different supervisors were obtained for the St. Louis, Houston and Chicago samples.

Rating Scale:

Form SP-21, "Descriptive Rating Scale" was used. This scale (see Appendix) consists of seven items with five alternatives for each item. The alternatives indicate the different degrees of proficiency.

Reliability:

The correlation between the ratings and re-ratings was .88, indicating satisfactory reliability. Therefore, the final criterion consisted of the combined score of the two sets of ratings.

Criterion Score Distribution:

Possible Range:	14-70
Actual Range:	23-69
Mean:	46.6
Standard Deviation	9.1

Criterion Dichotomy:

The criterion distribution was dichotomized into low and high groups by placing 31% of the sample in low criterion group to correspond with the percentage of workers considered to be unsatisfactory or marginal. Workers in the high criterion group were designated as "good workers" and those in the low group as "poor workers." The criterion critical score is 43.

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were selected for tryout in the norms on the basis of a qualitative analysis of job duties involved and a statistical analysis of test and criterion data. Aptitudes N, P, Q and M which do not have a significant correlation with the criterion were considered for inclusion in the norms because (1) Aptitudes P and M were considered important for the job and the sample had a relatively high mean score on these aptitudes; (2) Aptitude Q was considered because the sample had both a relatively high mean score and a relatively low standard deviation on this Aptitude. With employed workers, a relatively high mean score or a relatively low standard deviation may indicate that some sample preselection has taken place; Although Aptitude N would not normally qualify for consideration, it was considered because of its relatively high correlation with the criterion and its proven value for similar jobs. Tables 3, 4 and 5 show the results of the qualitative and statistical analyses.

TABLE 3

Qualitative Analysis

(Based on the job analysis, the aptitudes indicated appear to be important to the work performed.)

Aptitude	Rationale
P - Form Perception	Required in inspection of cut tin sheets, observing when refills of small flux hopper are necessary and in checking grease cups and spray equipment.
K - Motor Coordination	Required in coordinating various phases of job; start and stop machine, make movement between slitter and squaring shelf quickly.
M - Manual Dexterity	Required in movement of hands and arms in feeding material into machine; pounding, tamping, adjusting and positioning various materials and equipment.

TABLE 4

Means, Standard Deviations (SD), Ranges, and Pearson Product-Moment Correlation with the Criterion (r) for the Aptitudes of the GATB; N=49

	Mean	SD	Range	r
G - General Learning Ability	92.3	15.4	63-124	.088
V - Verbal Aptitude	92.3	12.6	74-133	-.041
N - Numerical Aptitude	90.3	18.7	52-132	.188
S - Spatial Aptitude	100.4	17.2	68-143	.002
P - Form Perception	100.2	21.2	53-157	-.051
Q - Clerical Perception	104.3	13.6	72-133	.036
K - Motor Coordination	98.4	17.9	62-138	.116
F - Finger Dexterity	89.7	20.0	43-135	.342*
M - Manual Dexterity	102.7	21.0	55-141	.217

*Significant at the .05 level

TABLE 5

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important					X		X		X
Irrelevant									
Relatively High Mean				X	X	X			X
Relatively Low Standard Dev.		X				X			
Significant Correlation with Criterion								X	
Aptitudes to be Considered for Trial Norms			N*		P	Q		F	M

*Aptitude considered because of its relatively high correlation with the criterion and its proven value for similar jobs.

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of a comparison of the degree to which trial norms consisting of various combinations of Aptitudes N, P, Q, F, and M at trial cutting scores were able to differentiate between 69% of the sample considered good workers and 31% of the sample considered poor workers. Trial cutting scores at five point intervals approximately one standard deviation below the mean are tried because this will eliminate about one-third of the sample with three-aptitude norms. For two-aptitude trial norms, minimum cutting scores of slightly more than one standard deviation below the mean will eliminate about one-third of the sample; for four-aptitude trial norms, cutting scores of slightly less than one standard deviation below the mean will eliminate about one-third of the sample. The Phi Coefficient was used as a basis for comparing trial norms. The optimum differentiation for the occupation of Body Maker And Side Seam Tender (tinware) 616.885-046 was provided by norms of N-75, F-75 and M-80. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .24 (statistically significant at the .05 level).

TABLE 6

Concurrent Validity of Test Norms, N-75, F-75 and M-80

	Nonqualifying Test Scores	Qualifying Test Score	Total
Good Workers	10	24	34
Poor Workers	9	6	15
Total	19	30	49

Phi Coefficient (ϕ) = .24 Chi Square (X^2_y) = 2.9
Significant Level = $P/2 < .05$

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study did not meet the requirements for incorporating the occupation studied into any of the 36 OAP's included in Section II of the Manual for the General Aptitude Test Battery. The data for this sample will be considered for future grouping of occupations in the development of new occupational aptitude patterns.

SP-21
Rev. 1/66

UNITED STATES EMPLOYMENT SERVICE

DESCRIPTIVE RATING SCALE
(For Aptitude Test Development Studies)

Score____

RATING SCALE FOR _____

D. O. T. Title and Code

Directions: Please read the suggestions to raters on the back of this form and then fill in the items listed below. In making your ratings, only one box should be checked for each question.

Name of Worker (print) _____
(Last) (First)

Sex: Male____ Female____

Company Job Title: _____

How often do you see this worker in a work situation?

- ☐ See him at work all the time.
- ☐ See him at work several times a day.
- ☐ See him at work several times a week.
- ☐ Seldom see him in work situation.

How long have you worked with him?

- ☐ Under one month.
- ☐ One to two months.
- ☐ Three to five months
- ☐ Six months or more

A. How much work can he get done? (Worker's <u>ability</u> to make efficient use of his time and to work at high speed.)

- ☐ **1. Capable of very low work output. Can perform only at an unsatisfactory pace.**
- ☐ **2. Capable of low work output. Can perform at a slow pace.**
- ☐ **3. Capable of fair work output. Can perform at an acceptable but not a fast pace.**
- ☐ **4. Capable of high work output. Can perform at a fast pace.**
- ☐ **5. Capable of very high work output. Can perform at an unusually fast pace.**

B. How good is the quality of his work? (Worker's ability to do high-grade work which meets quality standards.)

☐ 1. Performance is inferior and almost never meets minimum quality standards.

☐ 2. The grade of his work could stand improvement. Performance is usually acceptable but somewhat inferior in quality.

☐ 3. Performance is acceptable but usually not superior in quality.

☐ 4. Performance is usually superior in quality.

☐ 5. Performance is almost always of the highest quality.

C. How accurate is he in his work? (Worker's ability to avoid making mistakes.)

☐ 1. Makes very many mistakes. Work needs constant checking.

☐ 2. Makes frequent mistakes. Work needs more checking than is desirable.

☐ 3. Makes mistakes occasionally. Work needs only normal checking.

☐ 4. Makes few mistakes. Work seldom needs checking.

☐ 5. Rarely makes a mistake. Work almost never needs checking.

D. How much does he know about his job? (Worker's understanding of the principles, equipment, materials and methods that have to do directly or indirectly with his work.)

☐ 1. Has very limited knowledge. Does not know enough to do his job adequately.

☐ 2. Has little knowledge. Knows enough to "get by."

☐ 3. Has moderate amount of knowledge. Knows enough to do fair work.

☐ 4. Has broad knowledge. Knows enough to do good work.

☐ 5. Has complete knowledge. Knows his job thoroughly.

E. How much aptitude or facility does he have for this kind of work? (Worker's adeptness or knack for performing his job easily and well.)

☐ 1. Has great difficulty doing his job. Not at all suited to this kind of work.

☐ 2. Usually has some difficulty doing his job. Not too well suited to this kind of work.

☐ 3. Does his job without too much difficulty. Fairly well suited to this kind of work.

☐ 4. Usually does his job without difficulty. Well suited to this kind of work.

☐ 5. Does his job with great ease. Exceptionally well suited for this kind of work.

F. How large a variety of job duties can he perform efficiently? (Worker's ability to handle several different operations in his work.)

☐ 1. Cannot perform different operations adequately.

☐ 2. Can perform a limited number of different operations efficiently.

☐ 3. Can perform several different operations with reasonable efficiency.

☐ 4. Can perform many different operations efficiently.

☐ 5. Can perform an unusually large variety of different operations efficiently.

G. Considering all the factors already rated, and only these factors, how acceptable is his work? (Worker's "all-around" ability to do his job.)

☐ 1. Would be better off without him. Performance usually not acceptable.

☐ 2. Of limited value to the organization. Performance somewhat inferior.

☐ 3. A fairly proficient worker. Performance generally acceptable.

☐ 4. A valuable worker. Performance usually superior.

☐ 5. An unusually competent worker. Performance almost always top notch.

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FACT SHEET

Job Title: Body Maker (tinware) 616.885-046

Job Summary: Feeds blanks into hopper of body forming machine and observes operation of feed end of machine for malfunctions. Will also operate slitting machine or tend side seam soldering mechanism.

Work Performed:

Manually lifts small stacks of cut tin sheets from slitter. Places stack edge-down on a metal shelf in front of hopper. Uses both hands to pound this stack up and down a few times to square it. Visually checks all edges for irregular cuts, short pieces, or bad edges. Discards any sheet which appears sub-standard. Lifts this inspected stack from the shelf and places it into the hopper of the body making machine.

Starts and stops the machine as required. This is done by push-button. (A breakdown, jam, or other malfunction will stop the machine automatically.)

Removes jammed cans from the machine by hand, or by using a screwdriver. Calls attention to the assembly line maintainer, if the trouble appears to be in the mechanism itself.

Periodically checks grease cups and oil lines.

Keeps area clean. Makes certain that no dirt accumulates which could affect the operation of the machine. Occasionally wipes grease and dirt from machine surfaces.

In addition to the above duties, the body maker performs one or both of the following related functions:

1. Tends slitter machine: Cuts metal bands with shears to unbind stack of tinplate. Pushes stack manually on roller conveyor into loading hopper of slitter machine. Pushes button to start automatic slitting machine. Observes operation of machine for malfunctions. Observes that cuts are in register with enamelled material on metal. Pushes button to stop machine. Removes jammed metal sheets by hand and with hand tools. Notifies maintainer of machine malfunctions.

2. Tends side-seam soldering mechanism. Observes small flux hopper and refills when necessary. Makes visual observation of soldering operation to ensure that solder is flowing properly, that reservoirs are kept filled. Changes wiper buff and adjusts to proper pressure against can. (Wiper buffs are small wheels, about five inches in

diameter, and are used to wipe excess solder from the can as it passes by. The buff is changed when the Feeder notes that it has become worked or caked with solder so that it does not properly function. Changing the buff is accomplished by the use of a screw-driver.)

Uses can expander to break open can bodies to inspect soldered seam. This task is performed at intervals. Any irregularities are reported to the Assembly Line Maintainer. Periodically checks spray equipment.

Effectiveness of Norms: Only 69% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the S-441 norms, 82% would have been good workers. 31% of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the S-441 norms, only 18% would have been poor workers.

Applicability of S-441 Norms: The aptitude test battery is applicable to jobs which include a majority of the job duties described above.